TMT P2a Sensor Introduction

TMT.CTR.PRE.10.078.REL03

5/23/2011

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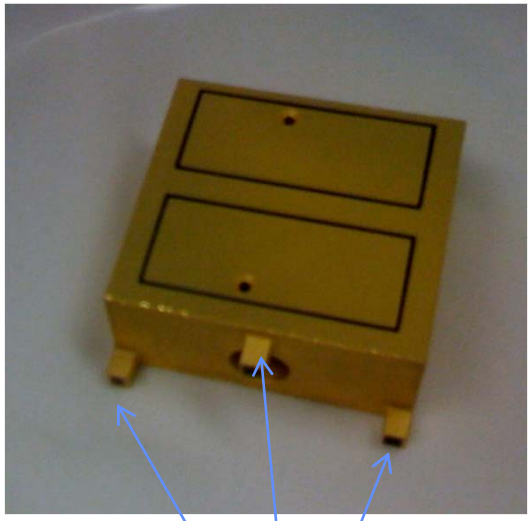
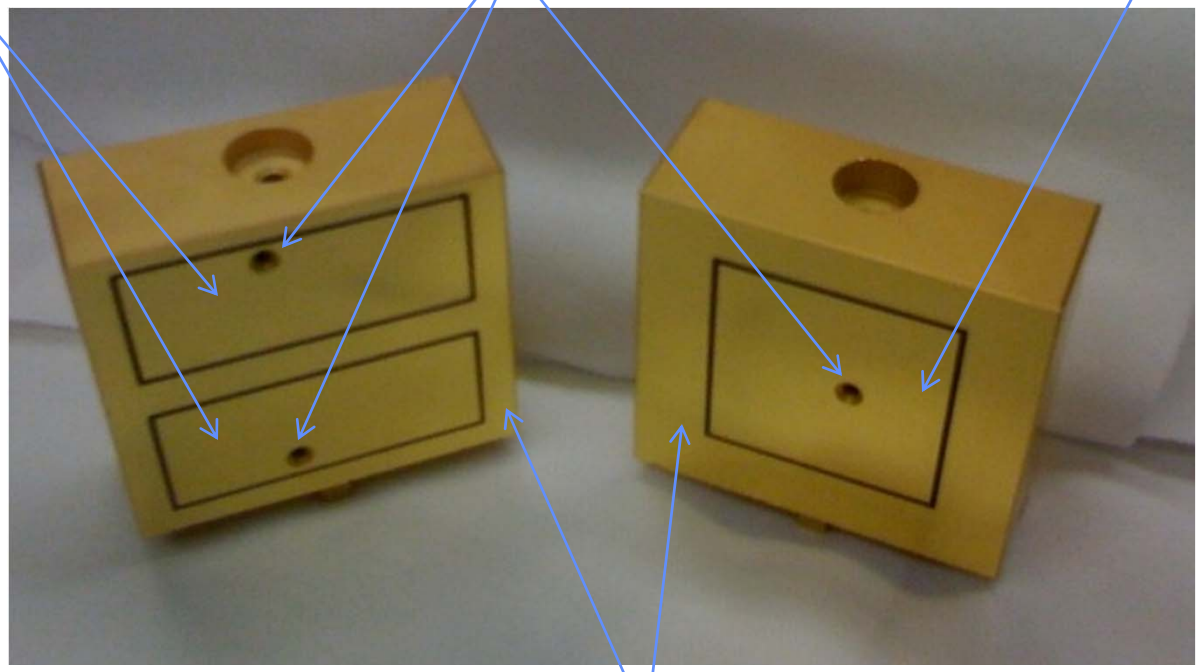
Intro

- P2a design goals:
  - Based on previously published TMT Edge Sensor design at
    - » http://tmt.org/documents
  - Design is updated to
    - » minimize potential effects from fringing fields and thermal expansion of the solder at the electrical connections,
    - » accommodate a purged dust boot,
    - » include updated requirements on electrode edges.

P2a Photo





Drive Electrodes

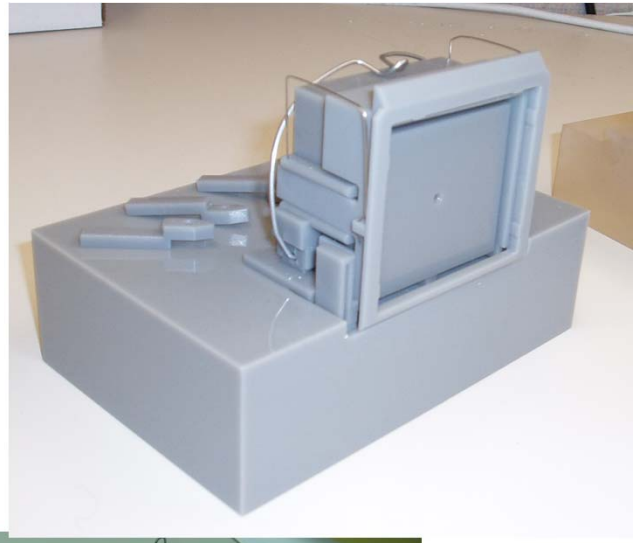
Feedthrough holes

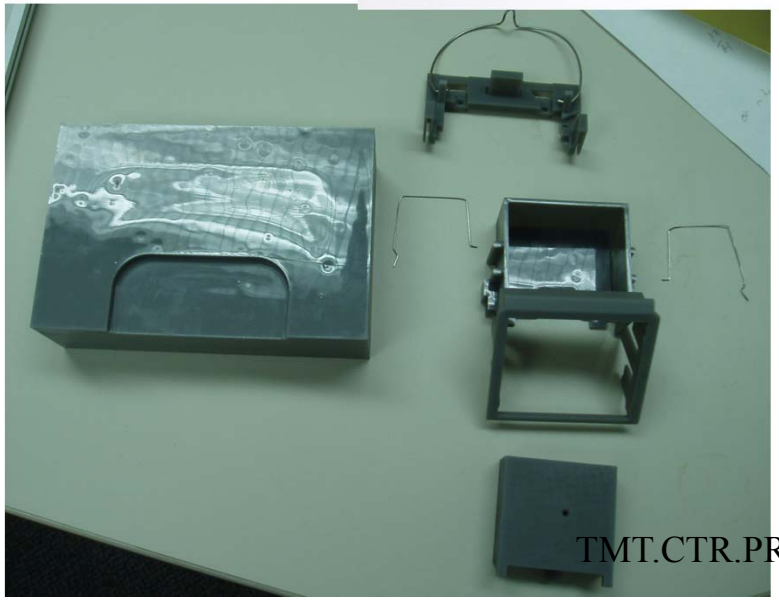
Sense Electrode

Feet

Guard Electrodes (coating on all sides except bottoms of feet)

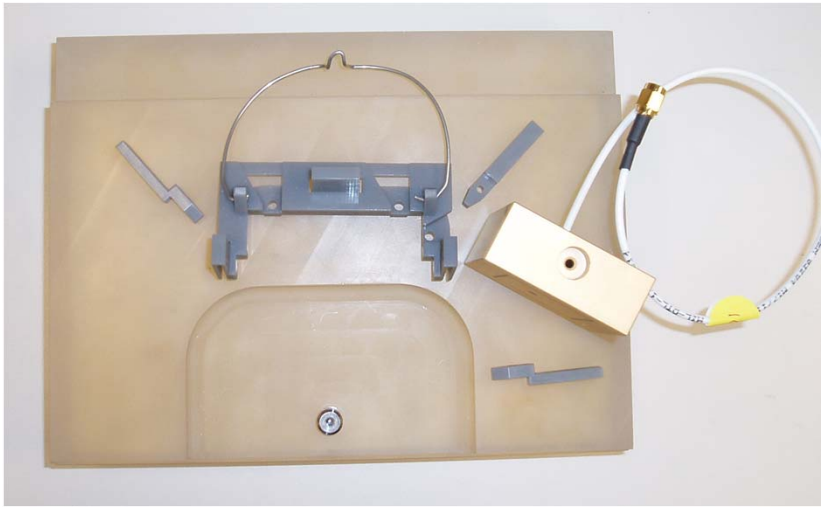
Dust cover and purge-system interface

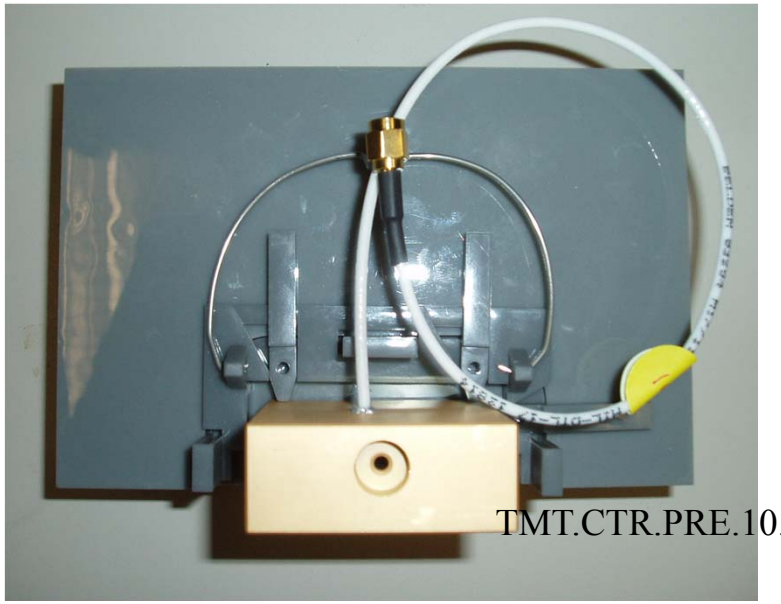




- Dust cover required to keep sensor clean, and provide a volume for the purge system to keep dry at high humidity
- Design uses a fixed backshell with a sliding mate – no handling required during segment exchange
- Separable base sets location of spacers for sensor block location
  - Backshell can be removed to check sensor location after transport or disturbance
- Small forces (F_x, F_z< 50 mN, F_y<100 mN) in all three axes to avoid distorting segment edge

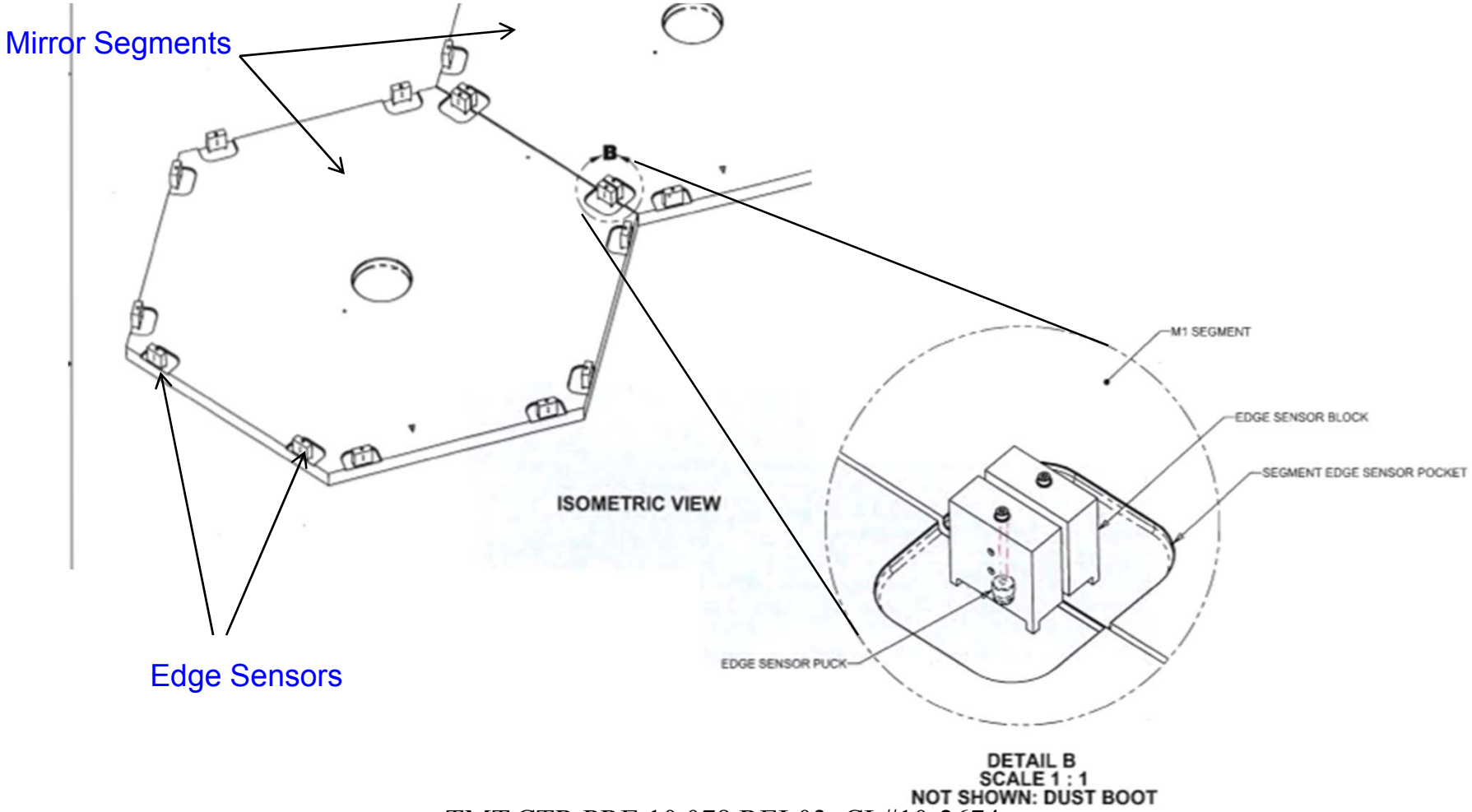
Sensor mounting



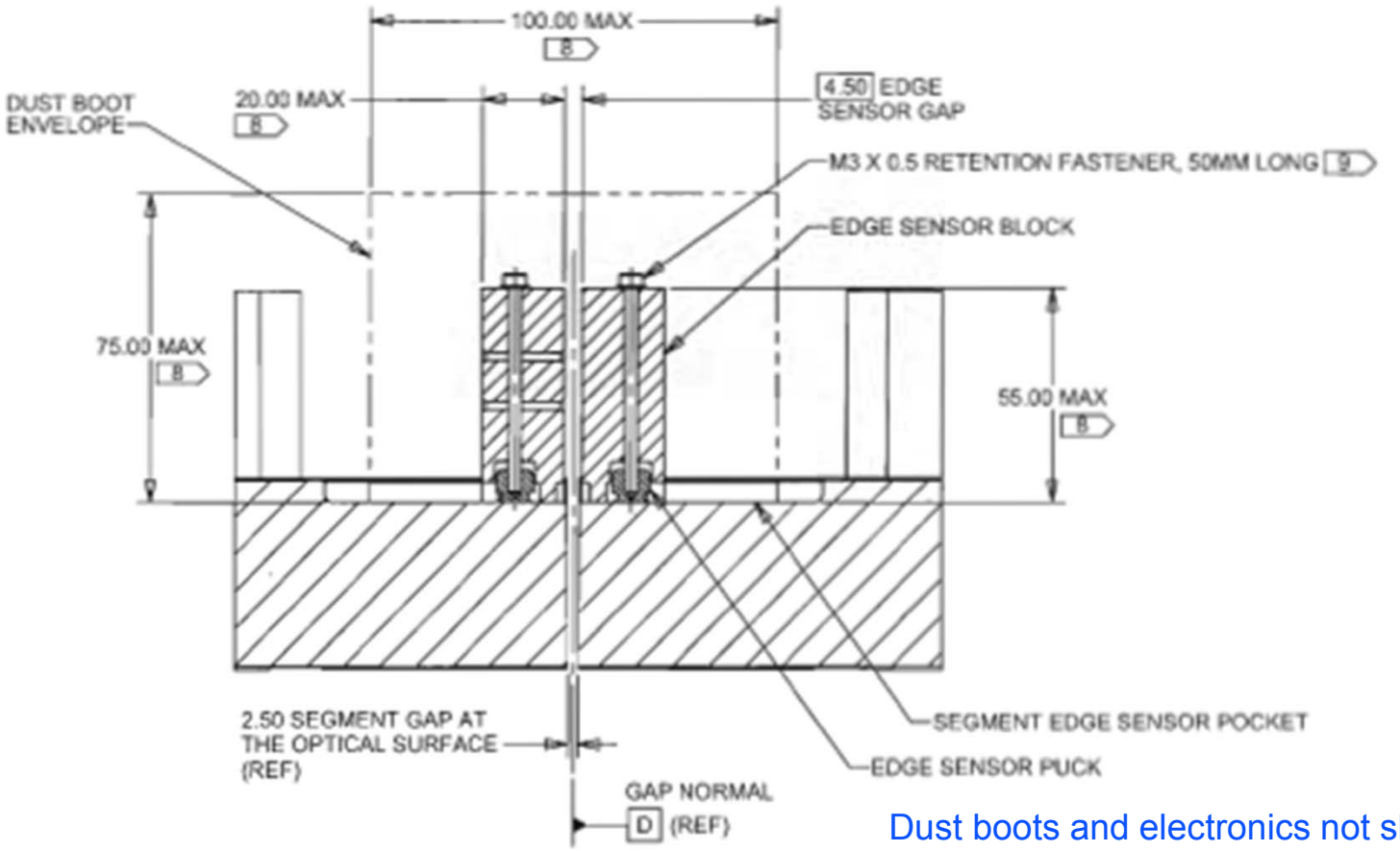


- Sensors mount in machined pockets on underside of segments
  - Held down by threaded rod to bonded puck
- Mounting tolerances maintained via reference to precision tolerances on pocket reference surfaces
  - Also tolerances on drive plate with respect to block feet
  - Separate jig measures distance from pocket to optical surface
- Spacer bars contact glass on pocket edge and on sensor block, base is low-precision
  - All three spacer bars are identical.
- Prototype mounting fixture shown with real sensor (note: glass block has oversized pocket – plastic block shows correct fit)
- Base stays in place as dust cover base. Spacer bars are removed. Cover can then be removed to check sensor location

Edge Sensor Mounting



Edge Sensor Mounting Detail



Dust boots and electronics not shown

Summary of P2a Design

- Maintain the electrode patterns (2 drive, 1 sense)
  - Increase gap between drive electrodes slightly
  - Etched pattern edge tolerance is +-0.5 micron
- Polish front surface to 60/40 scratch/dig
  - Other surfaces 15 micron or finer lapped finish
- Vertical feedthrough hole and countersink for mounting
- Feet provide clearance for purged dust boot
- Electrical feedthrough holes on drive electrodes avoid overlap with sense electrode
- Electrical feedthrough on sense electrode is offset to avoid interference with mounting hole.

Acknowledgements

The TMT Project gratefully acknowledges the support of the TMT partner institutions. They are the Association of Canadian Universities for Research in Astronomy (ACURA), the California Institute of Technology and the University of California. This work was supported as well by the Gordon and Betty Moore Foundation, the Canada Foundation for Innovation, the Ontario Ministry of Research and Innovation, the National Research Council of Canada, the Natural Sciences and Engineering Research Council of Canada, the British Columbia Knowledge Development Fund, the Association of Universities for Research in Astronomy (AURA) and the U.S. National Science Foundation.